

IV. "Flame Spectra at High Temperatures. Part II. The Spectrum of Metallic Manganese, of Alloys of Manganese, and of Compounds containing that Element." By W. N. HARTLEY, F.R.S. Received April 25, 1894.

(Abstract.)

The spectrum of manganese has been the subject of much investigation; the spark spectrum was examined by Huggins, Thalén, and Lecoq de Boisbaudran; the arc spectrum was studied by Ångström, Thalén, Cornu, Lockyer, also Liveing and Dewar; the flame spectra obtained from compounds of manganese were investigated by Simmler, Von Lichtenfels, Lecoq de Boisbaudran, and Lockyer, while Marshall Watts has given us accurate measurements of the wave-lengths of lines and bands observed in the spark and oxyhydrogen flame-spectra of spiegel-eisen, manganese dioxide, and other compounds of this metal.

When investigating the spectrum of the Bessemer flame, I found it necessary to compare the spectrum of elementary manganese under different conditions with that of its oxide when heated in the oxyhydrogen flame. Comparative experiments were made also with various alloys, as spiegel-eisen, silico-spiegel, ferromanganese, tool steel, and malleable nickel which contains manganese; also with compounds containing similar quantities of metal.

Metallic manganese was prepared by the electrolysis of manganese chloride, from which all other metals had been carefully separated. One preparation of pure manganese oxide was precipitated from a solution of potassium permanganate by the action of alcohol and a small quantity of sulphurous acid. Other specimens were precipitated from solutions of potassium permanganate by the addition of hydrogen peroxide. By this treatment pure manganic oxide containing only traces of potash was obtained. From one preparation even the potassium was removed.

Photographs of the spectra of metallic manganese and of manganic oxide were taken and compared. They were also compared with the spectra of the alloys of manganese. The periods of exposure varied from a mere flash in the case of spiegel-eisen when being poured into a Bessemer converter, to 30 minutes and even as much as 80 minutes with manganic oxide.

The leading features of the spectra of manganese and manganese oxide are the same, but they differ in detail, as may be observed by comparing the wave-lengths of the lines and bands in their respective spectra.

It will be readily understood that the bands can be measured with far less accuracy than lines, and that they are subject to some degree of variation in width, according to variation in the time of exposure and the temperature.

A striking group of lines, the most persistent in the whole of these spectra, is situated in the violet. The following measurements were made :—

4036·5	4034·9	Ångström, also Cornu.
4032·0	{ 4032·9 4031·8 }	Ångström.
4029·5	4029·4	Ångström.

Another line is just visible about 4031·8, but it is so close to 4032·0 that it could be discerned only when the extreme points of three very strong lines were examined, and the plate was in perfect focus for that region. The whole group of lines appears as two bands very closely adjacent, or in the manganese oxide spectrum as one band with the centre appearing as if reversed, the less refrangible being degraded and diffuse. These lines remain after the bands in the yellow and green have disappeared from the photographs, but the result may be quite otherwise with eye observations, owing to the greater visibility of the yellow over the violet rays.

Photographs of the spectra obtained with a dispersion of four quartz prisms of 60°, and lenses of 15 inches in focal length, are presented with the paper.

V. "Flame Spectra at High Temperatures. Part III. The Spectroscopic Phenomena and Thermo-Chemistry of the Bessemer Process." By W. N. HARTLEY, F.R.S., Royal College of Science, Dublin. Received May 4, 1894.

(Abstract.)

The flame issuing from the mouth of a Bessemer converter was first investigated by Sir Henry Roscoe* in 1863; by Lielegg,† and by Marshall Watts in 1867;‡ by Tunner,§ J. M. Silliman, Rowan,|| Von

* 'Literary and Phil. Soc., Manchester, Proc.,' vol. 3, p. 57, and 'Phil. Mag.,' vol. 34, p. 437.

† 'Sitzungsberichte Kaiserl. Akademie der Wissenschaften,' Wien, vol. 56, Part II.

‡ 'Phil. Mag.,' vol. 34, p. 437.

§ 'Dingler's Polytech. J.,' vol. 178, p. 465.

|| 'Phil. Mag.,' vol. 41, p. 1.